

about a cavity, others lie cross a cavity, as *G*. All these particles were eminently transparent.

About *A, B, C, D*, there are near the edge of the Nerve some transparent winding stiroaks.

Other Microscopical Observations, made by the same, about the texture of the Blood, the Sap of some Plants, the Figure of Sugar and Salt, and the probable cause of the difference of their Tasts.

IN my former I told you, how that the clearer aqueous matter of the Blood, being that Liquor in which the red sanguineous globuls swim, doth likewise consist of globuls; and that I had observed such in that aqueous matter, when the moisture was somewhat, or for the most part, exhaled. But now I cannot omit to acquaint you, that a few daies after I had sent away that Letter, I saw the plain globuls move in that waterish matter without any evaporation made; though there were but very few of them, and they appeared white where they lay together. And on this occasion I very well remember, that, about two years ago, I divers times observed my own Blood, and noted, that those sanguineous globuls that make the Blood red, seemed then to be firmer and harder than they are in my Blood now; at which time my Body was very much indisposed, so that I fell into a sickness, which held me near three weeks: But now I find those globuls of my Blood softer, and more sticking to one another, and my Body in a good state of health. I know not, whether some sicknesses, and even death it self, may not sometimes proceed from the hardness of those globuls. I am apt to imagine, that those sanguineous globuls in a healthy Body must be very flexible and pliant, if they shall pass through the small capillary Veins and Arteries, and that in their passage they change into an oval figure, reassuming their roundness when they come into a larger room.

Besides this, I have observed in the clear matter of the Blood figures of a quadrangular form, which I suppose to be some saline parts; further to be examined hereafter.

But I shall proceed to give you an account of the Observations I have made of the Sap of some Plants. *Arum* (*Wake-robin*) being tasted by me, and found very sharp upon the tongue, I found by my Microscope, that the Leaf thereof did consist of globuls not exactly round, and these again of particles incomparably smaller

smaller than those. Having pulled the Stalk from the Leaf, and transversly cut it thorough, I discovered in the parts of this Stalk (which I shall call *Pores*) very thin Figures, which at length appeared to me in *my* Microscope, of the thickness of a great Bread-knives back, and its thickness of that of a Spiders-web, when seen by the naked Eye. These fine Figures lay in the said Pores in a heap, in some, ten or fifteen of them together. Having cut some of the Leaves of this Herb in pieces, upon a clean Pewter-plate, and squeez'd the Juyce out of it, I found it so thick of its smallest parts, that it oufed but very slowly through blew Paper; and looking upon this strained Juyce, I found it also so thick, and so sticking, that I could observe nothing therein but partly abundance of small particles, which by reason of their smallness appeared not figured, partly some bigger parts, which likewise, by reason of their sticking matter, yielded no Figure to my Eye. But then viewing the thicker part of this Juyce, which remained behind in the Blew-paper, I saw, that that consisted almost all, excepting a little Sap, of the said very small particles, of which more than a thousand make one globul, and of which the Leaf was made up. And I imagined, that I saw, between the very small particles, some little Figures or Pipes, as I said I had seen in the pores of the stalk of the Leaf. But this I could not perfectly discern, by reason of the various parts that were in the Sap, how thin soever I spread it, and represented it to me. Holding some of the said thick Sap to a little fire, by which the said particles of the Leaf did in part burn away, I then noted very many of the said thin small figures or pipes, which I had seen in the Stalk of the Leaf. These little pipes were of a much firmer matter, than the particles which the Leaf was made up of; for, though I suffered most of the little particles of the Leaf to burn away in some places, yet the said small Pipes remained almost entire, without any visible detriment to them. And I afterwards saw in the expressed Sap of *Arum*, without holding it to the fire, the same little Pipes moving very plainly. And when after this, upon the fading of the Leaf, the seed upon the Stalk being yet green, I expressed the sap out of the Stalk, I perceived also the little pipes in this expressed Sap.

Now 'tis likely, that these Pipes in this Herb are the cause of the smart that is felt in chawing the *Arum*, by the motion of the
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moist Tongue in tasting: For that there may be a long-lasting motion, remaining in Liquors or Saps upon a little stirring (which in our case occasions the pain,) hath been divers times by me observed, and particularly in Water frozen in Winter, affixed to the pin of my Microscope: In this little Icy particle, though it be no bigger than a small pins head, I saw, as soon as it thawed, very many terrestrial particles moving in the water, (which before the congelation were not visible,) and continuing so long in that motion, that my eyes were tired with looking on. The like motion I have noted in the Juyce, squeezed out of the upper peel of a fresh Limon, wherein those little globuls, of which that peel is composed, do move, which are loosened by the squeezing of the Juyce. This motion of the said particles in the moisture is very pretty to behold, and many Spectators would swear they were little living Animals. Observing this motion, I conceived, that the motion of the sharp particles that are in some Saps, was not less, especially being set on by the motion of the Tongue.

What further concerns in general the Saps of Herbs observed by me, I find in them peculiarly figured small bodies, but that for the most part in such as I have suffered part of the moisture to be exhaled from. But such little Pipes, as I have mentioned to be in the Herb *Arum*, I have not discovered in any other Plants, hitherto viewed by me, but in the Sap of green *Vine-branches*, and *Asparagus*, and very many of them in the Sap of the stalk and leaves of *Cataputia* (*Spurge*,) and some few in the Sap which I squeezed out of the Root of *White Hellebore*. But to discover the vertues and operations of Herbs from the figures of their Saps, is an undertaking as yet too difficult for me. For, suppose there were half a score sorts of Herbs, in the Saps of which there were found one and the same Figure, as for example, such an one, in which the *basis* of the figure consists of a triangle, or quadrangle, and the sides of them running up to the shape of a Pyramid, after the manner of a well polisht triangular or quadrangular pointed Diamond (for such a Figure I have discovered in some saps of Herbs;) I am then to imagine, that, when I see such or the like figures in Saps, their beginning hath been a thousand or more times smaller; I must think besides, that we cannot discover any of the minute particles of any Sap, with the most perfect Microscope, but the little figure of them hath been from its beginning much smaller:

I esteem also, that when it is very small, it hath the same form and fashion with that when grown bigger, and being grown bigger, that it is composed of the said very small particles. Now, if these little figured parts of those Saps, which I suppose to be the smallest of that kind, and yet such, as that the *basis* of them is triangular or quadrangular, and that besides they are all alike strong, or equally flexible; if these, I say, did lye upon our Tongue, and were pressed against the globuls of our Tongue, and none of them all were altered by moisture or warmth, I should then judge, that all those little Figures of the said saps of Plants would have one and the same taste and operation.

To illustrate which, I shall here speak of the difference of the taste between *Salt* and *Sugar*. The grain of *Sugar* then consists of divers pointed and angular small Figures; and yet how angular and pointed soever these Figures are, they would not, if they remained intire, cause any taste upon our Tongue, forasmuch as (with submission to better Judgment,) their angles and points are big, each point or angle of these grains of Sugar not touching one or two globuls of our Tongue, but comprizing a great number of them; and that the rather, because I take it for granted, that a single globul, (of which bodies the pointed protuberances of our Tongue are made up,) is many thousand times smaller than a common grain of Sand, and therefore can produce no taste. For, take a polished pointed Diamond, of an ordinary bigness; and put it on the back of your hand with the point downward, and press it upon your hand with the force of a pound weight; this pressure will cause but little smart to the hand, in regard that the pressure or force, put to the Diamond, doth not only touch the extreame point of a Diamond, but many other points, forasmuch as our skin, being soft and pliable, will, where that extreame point comes to touch, sink a little inward, and so, according to the bigness of the Diamond, will close about the whole, or the greatest part of the same; whereby the skin will be toucht, as was said, not in one only point, but in many, though indeed most of all by that which is the sharp end of the Diamond. Now this seems to be the reason, why *Sugar*, if it were so hard and rigid as not to be dissolved in water, or warmth, would be insipid, forasmuch as it would not cause any pungency upon the globuls of the Tongue, when the Sugar-grains lye thereon, by reason of the small pressure made by the Tongue against the roof
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of the mouth. But then, if we should suppose, that a Diamond were thousands of times less, and were put upon our hand with the pressure of one pound weight, it would then not only cause smart, but doubtless, if no bones did hinder, run through the whole hand. Just so, if the small grains of Sugar were thousands of times less than they are, and rigid withal, then their points would not touch many globuls at once, but only one globul, and so would produce no pleasure but pain, for with their sharp angles they would wound the globuls of our Tongue. But, Sugar is a body dissoluble in water, and that the more readily if warmth do accompany it. Wherefore that substance, when put upon the Tongue, is dissolved by the moisture and warmth it meets with there, and unites with the *Saliva* of the mouth, and so proves even smooth and soft upon the Tongue, affecting it with pleasure. But *Salt*, on the contrary, though it dissolves in water as to its great parts, yet doth it retain some rigid small particles, which by warmth, when they are taken upon the Tongue, grow yet more rigid, and are so subtil, that they prick the globuls of our Tongue, though not so stiff, that they wound them.

To this I shall add my Observations about *Manna*: This substance I have found to consist of long small pipes, which I have seen, when put in water, to unite therewith as Sugar doth, and on that account is also sweet upon the Tongue. And representing that water to my eye as thin as I could, and suffering it to exhale, it afforded very pretty pipes; and adding some more warmth to it, those Pipes grew somewhat stiffer. Seeing this, I imagined, that as *Manna* dissolves in a little warmth, and in water, (both which is found upon our Tongue,) so in more warmth, which it meets with when taken down into our body, it changes into the said pipes: And, in regard that by the pricking of them there is caused in the globuls of our Bowels an unusual, preternatural and stronger commotion, the chyle that is there is carried off more strongly and more speedily, taking along with it that matter, which by the impulse of the pipes on the bowels is loosen'd. And adding yet some more fire to the pipes of the *Manna*, they turn'd into a kind of Syrup. This gave me thoughts, that the said pipes, not being strong, did work but softly upon our Bowels, and that this possibly was the cause of their kind operation; as also, that there being some bodies, in which there might be inwardly on extraordinary heat, the *Manna* might there, instead of shooting into pipes, turn
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into a syrup, and so produce little or no effect as to purgation.

But to return to the matter whence we have digressed, I mean to the sameness of Figures in ten sorts of Saps of Herbs, it may come to pass, that each of these Saps may, notwithstanding the identity of that Figure, yield a peculiar taste differing from the rest. For, suppose the small Figures that are in one Sap of the ten Herbs, to be of such a stiffness or hardness, as that they do in some degree affect the globuls of our Tongue, and so produce a taste proportionable; if the Figures of the Sap of another of those Herbs be a degree stiffer or harder, and so on of the rest, then will each degree of hardness in those Figures cause more or less sharpness of taste upon our Tongue, and consequently produce a sutable operation.

What I have observed in the examination of several sorts of *Wines* (in most of which I have discovered exceedingly pretty Figures) I must refer to another opportunity. Meantime, I shall be glad to hear how these my Observations are received, and what Objections are made against them, remaining

Yours, &c.

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